Louisiana

Department of Transportation And Development

Traffic Control Standard

Number 42

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LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
SPECIAL SPECIFICATIONS
12 IN LED TRAFFIC SIGNAL LAMP UNIT
Mast Arm and Span Wire Mount

1.0 SCOPE

1.1 This specification describes the minimum acceptable design and performance requirements for a 12 in LED (light emitting diode) traffic signal lamp unit.

2.0 12 IN LED TRAFFIC SIGNAL LAMP UNIT

2.1 General

2.1.1 The LED traffic signal lamp unit shall be designed as a retrofit replacement for existing incandescent signal lamps, which will not require any special tools for installation. The 12 in retrofit replacement LED traffic signal lamp unit shall fit into existing traffic signal housings without modifications.

2.1.2 Installation of a retrofit replacement LED traffic signal lamp unit into an existing signal housing shall only require removal of the existing lens, incandescent lamp, fitting of the new unit securely in the housing door, and connecting to existing electrical wiring or terminal block by means of simple connectors. The LED retrofit shall not require the removal of the reflector.

2.1.3 If proper orientation of the LED unit is required for optimum performance, prominent and permanent directional marking(s), that is an “UP arrow”, for correct indexing and orientation shall exist on the unit.

2.1.4 The manufacturer’s name, individual serial number, manufactured date, model number, and batch number shall be permanently marked on the backside of the LED traffic signal lamp unit. A label shall be placed on the unit certifying compliance to ITE standards.

2.1.5 The signal propose to furnish shall meet all of the requirements specified in this TCS as pertains to standard lenses and/or LED signal modules and their fit in the signal. The Department makes no guarantee as to any brand or model which we may be using now or in the future.

Each bidder, from whom a sample is requested, will be allowed to submit one sample to be equipped exactly as it is proposed to be furnished to the Department. If this sample does not meet the required specifications, bid will not be considered for award. The only allowable exception shall be the required green paint, sample signal may be submitted in your standard color.

2.2 Physical and Mechanical Requirements

2.2.1 The LED traffic signal lamp unit shall be a single, self-contained device, not requiring on-site assembly for installation into existing traffic signal housing.

2.2.2 The assembly and manufacturing process for the LED traffic signal lamp unit assembly shall be such as to assure all internal LED and electronic components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

2.2.3 Each LED traffic signal lamp unit shall comprise a UV stabilized polymeric outer shell, multiple LED light source, and a regulated power supply. LED are to be mounted on a polycarbonate positioning plate or conformally coated PC board.

2.2.4 The external lens shall be smooth on the outside to prevent excessive dirt/dust buildup. The optical lens/appearance of the lamp shall reflect a light distribution look similar to that of an incandescent lamp.

2.3 Optical and Light Output Requirements

2.3.1 The LEDs shall be manufactured using AlInGaP (Aluminum-Indium-Gallium-Phosphide) technology or other LEDs with lower susceptibility to temperature degradation than AlGaS (Aluminum-Gallium-Arsenic). AlGaS LEDs will not be allowed.

2.3.2 The color of the LED signal lamp shall be specified in the Invitation for Bids.

2.3.3 Each LED traffic signal lamp shall meet minimum laboratory light intensity values, color (chromaticity), and light output distribution as described in I.T.E. VTCSH (Vehicle Traffic Control Signal Head Standard) part 2 of the specifications 6.4.2.1, 6.4.4.1, 6.4.4.2, 6.4.4.3, 6.4.5 and 6.4.6 as a minimum. The table below replaces the values in Table 1 of Section 4.1.1 of the I.T.E. VTCSH. The LED signal modules are required to meet initial luminous values that are 115% of the required minimum values in the table below. The 6.4.2.1 test shall include an expanded view with the following minimums:

Minimum Luminous Intensity Values (In Candelas)

GRID SPECIFICATION FOR 12 IN RED (Stock# 14-03-4000)

Shaded area is ITE requirements for light intensity

	27.5	22.5	17.5	12.5	7.5	2.5	-2.5	-7.5	-12.5	-17.5	-22.5	-27.5
22.5U												
17.5U			3			10	10			3		
12.5U			14			20	20			14		
7.5U			20			54	54			20		
2.5U			58			220	220			58		
2.5D			77	141	251	339	339	251	141	77		
7.5D	16	38	89	145	202	226	226	202	145	89	38	16
12.5D	16	22	34	44	48	50	50	48	44	34	22	16
17.5D	16	20	22	22	22	22	22	22	22	22	20	16
22.5D			7			10	10			7		
27.5D												

GRID SPECIFICATION FOR 12 IN GREEN (Stock# 14-03-4010) AND YELLOW (Stock# 14-03-4005)

Shaded area is ITE requirements for light intensity

	27.5	22.5	17.5	12.5	7.5	2.5	-2.5	-7.5	-12.5	-17.5	-22.5	-27.5
22.5U												
17.5U			7			20	20			7		
12.5U			27			41	41			27		
7.5U			41			108	108			41		
2.5U			115			441	441			115		
2.5D			154	283	501	678	678	501	283	154		
7.5D	32	77	178	291	404	452	452	404	291	178	77	77
12.5D	32	44	69	89	97	101	101	97	89	69	44	44
17.5D	32	41	44	44	44	44	44	44	44	44	41	41
22.5D			14			20	20			14		
27.5D												

Arrow Indications (in candelas/m²)

	Red	Yellow (**Stk# 14-03-4020**)	Green (**Stk# 14-23-4025**)
Arrow Indication	5 500	11 000	11 000

LEDs for arrow indications shall be spread evenly across the illuminated portion of the arrow area. Arrow LED signal modules shall be tested in conformance with California Test 3001.

2.3.4 Measured chromaticity coordinates of LED signal modules shall conform to the chromaticity requirements of the following table, for a minimum period of 60 months, over an operating temperature range of -40ºC to +74ºC. Each LED traffic signal lamp unit shall meet the minimum requirements for light output for the entire range from 80 to 135 volts.

Chromaticity Standards

Red	Y: not greater than 0.308, or less than 0.998x
Yellow	Y: not less than 0.411, nor less than 0.995 – x, nor greater than 0.452
Green	Y: not less than 0.506 – 0.519x, nor less than 0.150 + 1.068x, nor more than 0.730 - x

2.3.5 LED signal modules tested or submitted for testing shall be representative of typical production units. Optical testing shall be performed with LED signal modules mounted in standard traffic signal section without visors or hood attached to the signal sections. LEDs for arrow indications shall be spread evenly across the illuminated portion of the arrow area.

2.3.6 After burn-in, LED signal modules shall be tested for rated initial luminous intensity in conformance with the provisions in "Optical and Light Output Requirements." Before measurement, LED signal modules shall be energized at rated voltage, with 100 percent on-time duty cycle, for a time period of 30 minutes. Test results for this testing shall record the current, voltage, total harmonic distortion (THD) and power factor (PF) associated with each measurement.

2.3.7 Photometric, luminous intensity and color measurements for yellow LED signal modules shall be taken immediately after the modules are energized. The ambient temperature for these measurements shall be 25ºC. Test results for this testing shall record the current, voltage, total harmonic distortion (THD) and power factor (PF) associated with each measurement.

2.4 **Electrical**

2.4.1 Each unit shall incorporate a regulated power supply engineered to electrically protect the LEDs and maintain a safe and reliable operation. The power supply shall provide capacitor filtered DC regulated current to the LEDs per the LED manufacturer specification. Design of the power supply shall be such that the failure of an individual component or any combination of components cannot cause the signal to be illuminated after AC power is removed. Any deviation without prior testing and approval from LADOTD shall be grounds for cancellation of the order. The power supply must be current regulated.

2.4.2 The LED traffic signal lamp unit shall operate on a 60Hz AC line voltage ranging from 80 volts RMS to 135 volts RMS. The circuitry shall prevent flickering over this voltage range. Nominal rated voltage for all measurements shall be 117 volts RMS.

2.4.3 The LED traffic signal lamp unit shall be operationally compatible with TS1, TS2, and 2070 controllers, conflict monitors with plus features, and malfunction management units currently used by the Louisiana Department of Transportation and Development and any other Louisiana government entities. In the case of conflicts between specifications, the latest LADOTD specifications will control.

2.4.4 A circuitry that will shutdown the LED module and power supply when 85% ITE light intensity specifications are not satisfied shall be provided. Prior to award the manufacturer may be required to effectively demonstrate this feature.

2.4.5 Each shipment shall be accompanied with a certified test report from an independent testing lab. Shipment will not be given final acceptance and in line for payment until full compliance with the certificate requirement. Random testing of average production modules will be tested to ensure compliance with specification.

2.4.6 Two, color coded, 36 in long, 600 V, 18 AWG minimum jacketed wires, properly terminated to the LED module to prevent moisture, dust, and other environmental substances from entering the LED module, conforming to the National Electric Code, and rated for service at 105°C, are to be provided for an electrical connection.

2.4.7 Individual LED's shall be wired so that a catastrophic failure of one LED light source will result in the loss of only one LED light source.

2.4.8 The LED signal shall operate with a minimum 0.90 power factor.

2.4.9 Total harmonic distortion (current and voltage) induced into an AC power line by a signal module shall not excess 20 percent.

2.4.10 LED signal modules and associated on-board circuitry shall conform to the requirements in Federal Communications Commission (FCC) Title 47, SubPart B, Section 15 regulations concerning the emission of electronic noise.

2.5 **Environmental Requirements**

2.5.1 The LED traffic signal lamp unit shall be rated for use in the ambient operating temperature range of -40ºC to +74ºC.

2.5.2 The unit shall be dust and moisture tight to protect all internal LED and electrical components.

2.5.3 The unit shall consist of a housing that is a sealed watertight enclosure that eliminates dirt contamination and allows for safe handling in all weather conditions. Moisture resistance testing shall be performed on LED signal modules in conformance with the requirements in NEMA Standard 250-1991 for Type 4 enclosures. Evidence of internal moisture after testing shall be cause for rejection.

2.6 **Production Testing Requirements**

2.6.1 Each new LED traffic signal lamp unit shall be energized for a minimum of 24 hours at temperature operating of +60ºC in order to cause any electronic infant mortality to occur, and to ensure electronic component reliability prior to shipment.

2.6.2 After the burn-in procedure is completed, each LED traffic signal lamp unit shall be tested by the manufacturer for rated initial intensity at rated operating voltage.

3.0 DOCUMENTATION REQUIREMENTS

3.1 Each LED traffic signal lamp unit shall be provided with the following documentation:

A. Complete and accurate installation wiring guide.
B. Contact name, address, and telephone number for the representative, manufacturer, or distributor for warranty repair.

3.2 Bidders shall be required to submit a copy of a test report certified by an independent laboratory (e.g. Intertek Testing Services ETL Semko) that the LED traffic signal lamp model submitted meets I.T.E. Standards for light distribution, chromaticity, and power (consumption, power factor and harmonic distortion) with the bid. The table in Item 2.3.3 of this specification replaces the values in Table 1 of Section 4.1.1 of the I.T.E. VTCSH.

3.3 One schematic diagram shall be provided for each LED model number, along with any necessary installation instructions.

4.0 WARRANTY

4.1 The LED traffic signal lamp unit shall be warranted against any failure due to workmanship, material defects or intensity within the first 60 months of field operation. The LED signal shall meet or exceed minimum luminous intensity values (2.3.3) during the 60 months of field operation.

4.2 The measured chromaticity coordinates of light emitting diode signal modules shall conform to the requirements for chromaticity in Section 8.04 and Figure 1 of the I.T.E. VTCSH over the temperature range of -40ºC to +74ºC.

4.3 The manufacturer shall provide a written warranty against defects in material and workmanship for LED signal modules for a period of 60 months after installation of LED signal modules. Replacement LED signals modules shall be provided within 5 days after receipt of failed LED signal modules at no cost to the department.

5.0 MEASUREMENT

Measurement shall be made of each LED traffic signal lamp unit as specified in the invitation for bids. A certified test report shall be provided to LADOTD assuring that these LED traffic signal lamps meet LADOTD specification.

6.0 **PACKAGE**

Each LED module shall be individually packaged, and delivered securely bound on pallets. Each package to be labeled with color of module, manufacturer's name, individual serial number, manufactured date, model, and batch or lot number.